The Johns Hopkins University
APPLIED PHYSICS LABORATORY
Silver Spring, Maryland

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QUARTERLY STATUS REPORT

ON

EFFICACY OF ALKALI - SUPEROXIDE BEDS

FOR BACTERIA REMOVAL FROM AIR

CONTRACT R-21-009-007

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Prepared by: Stanley J. Burdick — Date June 17, 1966
Stanley J. Burdick

Approved by: R. C. Evans — Date June 17, 1966
Dr. R. C. Evans

Approved by: — Date June 21, 1966
Dr. R. G. Bartlett, Jr.

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I. INTRODUCTION

The potassium superoxide, thin-bed canister has been subjected to a second series of systematic tests. This effort was undertaken to obtain additional data on the trends indicated by the variance of the four parameters in the first series of experimental tests. Figure 1 shows the complete factorial experiment for all possible interactions. The 13 tests indicated by an X in Figure 1 show the recently completed set of experiments.

II. SUMMARY OF EXPERIMENTAL RESULTS

The data collected and calculated from the second series of experiments are summarized in Table I. The first six columns give the conditions under which the experiment was performed. The remaining columns are calculated values indicating the overall performance of the canister.

The general trends resulting from a preliminary evaluation of the first test series appear to be confirmed by the data from the second test series. Increasing oxygen evolution and carbon dioxide absorption result from increasing relative humidity. The thinner beds lead to more efficient oxygen evolution and carbon dioxide absorption.

Increasing the rate of gas flow results in increasing oxygen evolution and decreasing carbon dioxide absorption. Oxygen evolution increases with decreasing particle size but the effect of particle size on carbon dioxide absorption is still inconclusive. A more detailed evaluation of all of the data will be given in the final report.

III. FUTURE PLANS

Supplementary experiments testing the efficacy of the superoxide canister toward bacteria are planned. Previous data indicated that the physical effect of the superoxide toward bacteria was greater than the chemical effect. A further elucidation of the mechanism by which the potassium superoxide destroys the bacteria was considered desirable.

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% RELATIVE HUMIDITY		40%			52%			70%			97%		
BED DEPTH	Gas Flow (cc/min) / Mesh	250	565	1000	250	565	1000	250	565	1000	250	565	1000
1/8 Inch	7-12	X											
	12-24												
	24-42			X									
	42-80				X								
	80-170					X							
1/4 Inch	7-12						X						
	12-24							X					
	24-42												
	42-80									X			
	80-170										X		
1/2 Inch	7-12											X	
	12-24												X
	24-42											X	
	42-80										X		
	80-170									X			

FIGURE 1

COMPLETION OF SYSTEMATIC SELECTION

OF EXPERIMENTS

TABLE I EXPERIMENTAL RESULTS

Run #	% R.H.	Gas Flow (cc/min)	Bed Depth (inch)	Mesh (Tyler Scale)	Initial % CO_2	Weight KO_2 (gms.)	Absorbed CO_2 (liters)	Evolved O_2 (liters)	% O_2 Evolved	Run Time (min)	Time to .5% CO_2 (min)	Overall R. Q.
116	70.5	250	1/4	12-24	4.07	57.10	-	1.333	12.8	280	>280	-
117	91.5	565	1/2	7-12	3.97	117.40	2.155	4.432	19.2	280	>280	.49
118	98.0	1000	1/2	12-24	4.22	103.00	1.087	10.859	49.8	280	>280	.10
119	97.5	565	1/2	24-42	3.94	98.00	1.086	5.235	25.6	280	>280	.21
120	96.5	250	1/2	42-80	4.05	91.80	.813	4.374	24.2	280	>280	.18
121	96.0	250	1/4	80-170	3.85	40.80	2.714	3.602	43.9	280	>280	.75
122	71.5	1000	1/4	42-80	3.94	47.80	7.890	7.756	89.1	280	234	1.01
123	70.0	1000	1/2	80-170	3.75	79.80	8.218	11.349	73.4	280	>280	.72
124	54.0	1000	1/4	7-12	4.15	72.90	6.714	9.228	61.1	280	198	.73
125	52.0	565	1/8	80-170	3.84	24.40	3.361	4.227	82.5	280	151	.80
126	52.5	250	1/8	42-80	3.94	28.90	1.074	1.274	21.5	280	>280	.84
127	42.5	1000	1/8	24-42	3.90	25.10	3.702	4.331	81.9	280	74	.85
128	43.0	250	1/8	7-12	3.81	39.30	1.037	1.913	23.4	280	>280	.54